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SURVEYING ALLOSTERIC COOPERATIVITY AND COOPERATIVE INHIBITION IN MUSHROOM TYROSINASE

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ABSTRACT

In view of the increasing importance of controlling tyrosinase activities, this paper addresses the true kinetics of both activities of MT. Eadie–Hofstee analysis of the kinetics results obtained from the direct spectrophotometric measurements of the cresolase activity in the presence of p*-coumaric acid and MePAPh and catecholase activity in the presence of caffeic acid and MePACat*

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showed deviation from linearity at lower and higher concentrations of the substrates. Comprehensive kinetics studies on both activities of MT resulted in typical saturation curves of the enzymes displaying mixed cooperativity. The analysis of the double-reciprocal plots and the slope analysis of the Hill plots of the kinetics data indicate negative cooperativity in both activities. However, it is more pronounced in the cresolase activity. Using the results of some inhibition studies on the cresolase activity, the obtained kinetics results have been explained and discussed in terms of allosteric cooperativity, cooperative inhibition and mixed-cooperativity.

PRACTICAL APPLICATIONS

Tyrosinase is a widespread enzyme with great promising capabilities. The past decade research has just started to unfold some other important roles of tyrosinases. In spite of the outstanding progress of the tyrosinase science, there are still some important and immediate issues which have to be addressed. Considering the massive number of different formulations in the healthcare and cosmetic market which contain tyrosinase controlling substances, it seems that elucidation of true nature of the tyrosinase kinetics has become a necessity. Besides, tyrosinases are important subjects of many ongoing researches mainly due to their key role in the enzymatic browning phenomenon which affects the quality of fruits, vegetables and crop products.

The outcome of this research can be quite meaningful to the current studies on controlling tyrosinase activities in medicine, nutrition, physiology and biotechnology.

INTRODUCTION

Tyrosinase (monophenol monooxygenase; polyphenol oxidase; catechol oxidase; oxygen oxidoreductase; EC. 1.14.18.1) is a ubiquitous cuproenzyme (Solomon *et al.* 1996). Although it is famous for its critical role in melanogenesis, new researches indicate the contribution of tyrosinase in more diverse natural processes (Rios *et al.* 1999; Strack and Schliemann 2001; Eisenhofer *et al.* 2003). Tyrosinases have been studied from different points of view, in particular, edible MT, because of its availability and close similarity with mammals' tyrosinase (Seo *et al.* 2003). Yet some important aspects of the enzyme structure, mechanism and behavior have been unresolved.

Growing concern about melanoma and the side effects of the high energy rays of the sunshine, and the increasing attraction of the cosmetic whitening and tanning formulations have already brought about an upsurge in the use